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AUTHOR Halnen, Andrew; And Others
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ABSTRACT

This sampler for teachers provides information for initiating and dealing with environmental studies in the classroom. Utilizing an interdisciplinary approach, behavioral objectives related to environmental awareness are listed for social studies, science, mathematics, language arts, health, physical education, recreation, music, and local geography. These objectives attempt to show how much environmental education may already be a part of the curriculum. Following these are two sets of charts to help the teacher understand how behavioral objectives may be used in the design of an environmental education curriculum. One set is centered on four basic concepts involving social, cultural, technological, and ecological implications. The other emphasizes individual objectives and associated outcomes. Also included are a variety of activities in different disciplines, sample lessons for both primary and intermediate grade levels, discussion questions and ideas, working procedures for selected activities, sample data collection charts, a glossary of terms, and a case study involving land use and town government. (BL)

ENVIRONMENTAL SAMPLER AWARENESS

CONTENTS

INTRODUCTION

Environmental education is a learning-teaching process involving the interaction and interdependence of man, air, water, land and all living organisms. Nature study, outdoor education, ecology, conservation, and technological growth are all aspects of the term environmental education.

This sampler provides information for dealing with environmental education in the classroom. We have included a list of behavioral objectives many of which may already be part of your existing curriculum. Working procedures and selected activities are offered for you to try with these behaviors.

We hope you will be encouraged and motivated to try some of these activities. Let us know of your successes and how we may improve this sampler of materials on environmental education.

Andrew Halnen
Antionette Powers
Karen Christaldi

August 1971

RATIONALE

Children are natural investigators; they love to explore and discover; their natural curiosity is unbounded. The study of natural and man-made environments is truly fascinating to them.

Environmental awareness is utmost in the minds of many educators. As the cities sprawl outward and the wilderness gradually disappears our natural resources become more scarce. An increasing number of organizations and citizens are involved in the monumental task of using the environment to achieve the highest quality of living for mankind. In the future it will be left up to the younger generations to make important decisions about our natural resources and environment. Are they now behaving in such a way as to be able to cope with these problems? The school has an important role to play in creating environmentally literate citizens who will not only be aware but will act to improve the environment.

The school environment must provide means and materials which will allow children to express and develop their natural curiosity.

Following are some goals that the teacher may use as guides for children as they study the interdependencies on the planet earth:

1. To gain an understanding of the balance of nature and the food chain.

2. To develop skills in the process of scientific inquiry.

3. To realize that conservation of any of our natural resources, including the human resources, is a job that must be done for it concerns our survival.

4. To develop in everyone an attitudinal change from "What can one person do" to "Everyone can play a role."

5. To understand that technological change, such as building new dams and harbors, is not always for the better unless carefully planned.

6. To gain a respect for the domain of science as a broad field of never-ending struggle and unavoidable crisis in which man constantly endeavors to improve and understand all problems that affect the environment though he realizes final solutions are impossible to achieve.

These goa. or basic objectives reveal reasons for providing learning experiences in environmental studies. In a school program, the development of certain behavioral patterns appropriate to children as they work in different environments is important. We do not want to stuff minds with scientific concepts or perceptions. Rather we seek to change certain behaviors.

The entire approach to environmental education should encompass all disciplines. Some behaviors applicable to different subject matter areas are listed in this guide. It is hoped that the list will give the teacher an idea of what environmental education can accomplish for students.

Under what subject matter area is the environment studied? Is conservation studied in science, mathematics, or social studies? These are hard questions to answer but the questions show why an environmental education program is difficult to design.

If the program begins with a set of behavioral objectives, the task of creating a school curriculum or classroom unit will give the teacher an idea of how much environmental education is already a part of the curriculum.

SOCIAL STUDIES

- Identifies and uses the recreational facilities in his community
- Identifies the values inherent in recreational facilities
- Identifies ways to preserve and protect natural resources
- Describes how man adapts himself to fit his environment
- Demonstrates ability to participate in group planning
- Writes letters and participates in club work to show concern for ecology
- Conducts or participates in conservation projects in camp and the local community
- Uses campcraft and woodlore skills which aid in living comfortably in the outdoors
- Dramatizes the life of the people of other cultures
- Demonstrates the ability to read maps
- Constructs maps
- Navigates by using a map
- Uses safe practices with matches and fires
- Identifies local sources of land, air, and water pollution
- Describes the important part weather plays in the air pollution problem
- Describes methods to remedy pollution problems of land, air, and water
- Identifies other sources of pollution such as chemical plants, oil refineries, paper plants, etc.
- Identifies ways industries are combatting pollution

- Identifies how trees and other living things are affected by air pollution
- Lists wasted resources in pollutants and refuse
- Recycles paper and other materials when possible
- Makes a compost heap from refuse
- Refrains from littering
- Takes an active part in a clean-up compaign

SCIENCE

- Describes patterns and interrelationships that exist between producers and consumers in a community: pond, seashore, forest, etc.
- Identifies common types of rocks natural to his geographical area
- Collects and classifies rocks
- Analyzes rocks to identify them
- Describes fertile soil
- Classifies soil by testing for pH, humus content, etc.
- Describes causes of erosion
- Demonstrates ways to prevent soil erosion
- Identifies evidence of glacial action
- Identifies changes in physical features such as tree line or snow line which help show changes in elevation
- Lists things he uses each day which come from the soil
- Plants and maintains a garden
- Cares for indoor plant life
- Describes the purpose of crop rotation
- Describes the values of organic gardening
- Describes the interdependence of plants and animals in the 0_2 and $C0_2$ cycles
- Refrains from destroying plant life
- Refrains from destroying animal habitats
- Refrains from needless killing of animals
- Explains for chain and population relationships
- Observes evidences of animal life
- Raises an animal in a proper habitat
- Discusses forest and wildlife management practices
- Uses simple keys to identify plants and animals
- Distinguishes trees by five characteristics – leaves, bark, wood, fruit, and buds

- Uses binoculars and/or hand lense to make field studies
- Predicts weather with some degree of accuracy
- Reads and interprets weather maps
- Identifies three major cloud formations
- Uses his knowledge of the winds for various activities such as boating, building a fire, tracking animals, etc.
- Maintains a weather station
- Predicts affects of large bodies of water and mountains on the weather
- Locates directions by stars, compass, and map
- Identifies the Milky Way, the major constellations, comets, meteors, and planets as well as Aurora Borealis
- Constructs a telescope, microscope, or spectroscope
- Uses a telescope to study astronomy
- Identifies the phases of the moon
- Describes the effects of the moon and sun on tides
- Identifies sea shells and sea life
- Interprets tide tables in planning activities on the ocean or beach
- Constructs and maintains an aquarium, terrarium, and vivarium
- Understands the values of ocean farming for man's future needs
- Lists the minerals resources of the oceans
- Lists five ways that the ocean is beneficial to man
- Constructs and maintains a bird house, earthworm farm, ant farm, etc.
- Constructs a topographic map of his area
- Moves boulders and logs using the principles of leverage
- Tests water for drinking purposes
- Lists the four standards of quality of fresh water
- Refrains from eating unfamiliar food

MATHEMATICS

- Determines the size of specific areas through the use of such measurements as acres, square miles, square yards, and square feet
- Determines the degree of slope
- Determines the time necessary to walk a certain distance
- Measures displacement in the freeboard of a boat by the changes in weight dispersement
- Determines distance across a lake, height of a tree, etc. through the use of geometric principles such as shadow reckoning, ratio and proportion

MATHEMATICS (Continued)

- Computes the cost of supplies for various activities
- Uses knowledge of liquid and solid measurement for meal planning
- Computes the cost per person of meals
- Computes financial cost of field trips
- Reads weather instruments and makes prediction
- Makes graphs of daily weather records
- Computes the amount and cost of water wasted from a dripping faucet in given amount of time
- Calculates monthly temperature averages
- Uses map instruments such as compass and scale rulers
- Constructs scale maps, charts and graphs
- Uses the concept of board feet to measure a tree
- Uses a forester's formula for measuring the yield of lumber from a given tree
- Determines the cubic yards of dirt necessary to fill in an eroded or dangerous area
- Calculates the amount of soil in a run-off stream
- Observes geometric patterns in nature
- Draws plans for a bird house or other animal homes
- Predict what the expected population will be in ten years given the present population and the expected rate of increase for various local, state, national and international areas

LANGUAGE ARTS

- Takes field notes
- Writes letters to conservation or government agencies for information
- Writes letters to political leaders about contemporary conservation issues
- Writes reports on camp activities or field trips
- Maintains a daily log
- Writes stories about the outdoors
- Locates reference material and literature concerned with the outdoors in the library
- Writes creative stories, poems, etc. inspired by the out-of-doors
- Reads nature stories
- Participates in storytelling
- Locates documented evidence to verify observations and deductions made in the field
- Labels specimens and nature trails
- Participates in preparing and presenting a program about camp activities
- Takes an active part in discussions involved in planning and evaluating trips
- Reports about field trips and observations

- Participates in hiking, and tracking animals
- Participates in various outdoor recreational sports such as archery, fishing, skiing, swimming, and ice skating
- Obeys rules and follows regulations in outdoor activities such as boating, fishing, etc.
- Uses safe practices while hunting, fishing, swimming, etc.
- Collects shells, butterflies, rocks, etc.
- Develops a hobby
- Participates in games
- Uses proper equipment when hiking or mountain climbing
- Uses forest tools properly such as hatchet, knife, etc.
- Builds and extinguishes a good campfire
- Cuts logs for firewood
- Describes techniques of survival in out-of-doors
- Constructs adequate shelter using available materials
- Dresses properly for the outdoors
- Paces himself in activities, such as hiking, according to his own limitations
- Uses first aid knowledge in an emergency
- Plans and prepares balanced menus
- Takes proper precautions when looking for drinking water
- Takes precautions in eating unfamiliar foods
- Makes rubbings of grave stones, leaves, tree trunks, etc.
- Makes tools out of natural materials as the pioneers did such as gourds, scoops, wooden ladles, stone hammer, etc.
- Uses natural materials as designs for various works of art
- Designs birdhouses and other animal homes
- Makes models of animals
- Draws and paints local outdoor scenes
- Constructs nature trail signs
- Draws charts and other illustrations of natural phenomena
- Collects seeds, flowers, stones, and other materials for making creative arrangements
- Makes leaf and fern prints
- Constructs a relief map
- Makes animal track castings
- Constructs junk sculpture by recycling materials

MUSIC

- Listens to and records bird calls and songs, frogs, a running stream, wind in the trees and other sounds of nature
- Makes musical instruments out of natural materials, or solid waste materials
- Sings songs about the environment as "Happy Wandered", "Jeremiah -- Joy to the World", etc.
- Explains meaning of folk songs
- Makes Indian musical artifacts such as drums and rattles
- Explains meaning of folk songs
- Listens to great works of music, such as the Grand Canyon Suite, and relates them to the outdoors
- Hikes in rhythm while signing or whistling

SUPPLEMENTAL CITY LIST

- Identifies causes of air and water pollution
- Identifies the causes of noise
- Lists ways to remedy problems of pollution
- Lists ways to remedy problems of noise
- Explains causes of city smog
- Makes a weather chart
- Measures radioactivity in the air and water
- Tests water for oxygen and the amount of pollution
- Describes the causes of traffic congestion
- Traces the supply of water, electricity and heat into his city to his home
- Describes the collection and removal of garbage and trash to its final stages
- Identifies sources of electrical power
- Describes where imported materials come from
- Measures the amount of wasted water from a dripping faucet
- Specifies ways to dispose of abandoned automobiles
- Suggests ways to beautify the neighborhood or city
- Helps keep his community free from litter
- Calculates the number of square feet of space per person (then also the recreational space per person)
- Describes considerations concerning land that must be taken for buildings
- Describes ways to control pests (such as rats and termites)
- Grows plants from seed, leaves, roots, or bulbs
- Takes care of a classroom pet
- Describes how bridges are constructed to allow for changes in temperature

- Describes how bridges are constructed to allow for changes in weather conditions
- Describes why sidewalks and streets crack and bulge
- Explains why chimneys lean due to the earth's heating by the sun
- Describes life activity in the concrete world of the city
- Identifies causes of house fires
- Describes the practical applications of math in construction work

The Environmental Education Charts on the following page will help the teacher understand how a set of behavioral objectives may be used in the design of an environmental education curriculum. Several charts have been filled out as illustrations. One is left blank for the teacher to use.

There is a need to know the basic concepts that underly any study of environment. Four basic concepts (partially taken from Brandwein, Conceptual Schemes, 1964) have been used. These concepts cover the wide range of understandings in environmental studies. In using the Environmental Education Chart, start by picking a behavioral objective from the list. Next decide, and check, which concept or concepts the behavior would involve. Finally devise or find activities which will elicit the desired behavior.

How does a busy teacher do this? Help is offered in this sampler in the form of activities, questions, lesson plans, a glossary and a case study. In addition, the Curriculum Center and the Library have many varied materials (kits, case studies, units, games, books, as well as audi-visual aids). Drawing upon all these sources you will be able to provide an interesting study of the environment.

ENVIRONMENTAL EDUCATION CHART

Social, Cultural, Technological and Ecological Implications

CONTENT / BEHAVIOR	There is an interchange of material and energy between living things and their environment.	The organism is a product of its heredity and environment.	Physical features and living things have changed over the years.	Despite his present position of dominance on earth, man is dependnet upon other living and non-living things for his existence.	SUGGESTED ACTIVITIES

ENVIRONMENTAL EDUCATION CHART

Social, Cultural, Technological and Ecological Implications

BEHAVIOR / CONTENT	There is an interchange of material and energy between living things and their environment.	The organism is a product of its heredity and environment.	Physical features and living things have changed over the years.	Despite his present position of dominance on earth, man is dependnet upon other living and non-living things for his existence.	SUGGESTED ACTIVITIES
Describe patterns and interrelationships that exist between producers and consumers in a pond community.					Observe a pond community in your area. Investigate the activities suggested in ESS "Pond Water" View: Filmstrip—FSS Our Environment: Fresh Water Communities 574.5 The Freshwater Community 574.92 Pictures Familiar Fresh Water Fish 597.09 Transparencies Microscopic Life 591.92 Poster Read: Pond Life, Reid and Rim

ENVIRONMENTAL EDUCATION CHART

Social, Cultural, Technological and Ecological Implications

BEHAVIOR / CONTENT	There is an interchange of material and energy between living things and their environment.	The organism is a product of its heredity and environment.	Physical features and living things have changed over the years.	Despite his present position of dominance on earth, man is dependnet upon other living and non-living things for his existence.	SUGGESTED ACTIVITIES
Compute cost of needs per person					Visit grocery store Read and compare prices of food in newspaper ads. View filmstrips: Food--fuel for the Body 641.3 Supplying Food for Our Cities 641.3 Read: Booklet How Body Uses Food Book Dahl, Ronald Charlie and the Chocolate Factory

ENVIRONMENTAL EDUCATION CHART

Social, Cultural, Technological and Ecological Implications

BEHAVIOR / CONTENT	There is an interchange of material and energy between living things and their environment.	The organism is a product of its heredity and environment.	Physical features and living things have changed over the years.	Despite his present position of dominance on earth, man is dependnet upon other living and non-living things for his existence.	SUGGESTED ACTIVITIES
Knows and Uses recreational facilities in his community					Reads map (Parks & Public Lands in Wellesley) to locate areas where he can swim, sail, fish, skate, soccer, hockey, etc. Read: Schedule of Recreational Activities Plan for a better use of the School ground. (See Lesson "Looking at School Site Planning").

13.15

A second chart has been developed that places emphasis on the objectives, rather than the concepts. Three objectives and suggested activities and materials are worked out on the following charts. One has been left blank for your use.

BEHAVIORAL OBJECTIVES

OBJECTIVES	ACTIVITIES	OUTCOMES

Science Discipline

BEHAVIORAL OBJECTIVES

OBJECTIVES	ACTIVITIES	OUTCOMES
Describe patterns and interrelationships that exist between producers and consumers in a pond* community.	* Observe a pond community in your area. * View materials: --Pictures – Familiar Fresh Water Fish –Transparencies – Microscopic Life –Poster – Pond Life –Filmstrip Set – Our Environment: Fresh Water Communities –Filmstrip – Fresh Water Communities *Investigate activities suggested in ESS "Pond Water" *Read "Pond Life" – Reid & Zim	The student will be able to: *List on a chart producers primary and secondary consumers (See Sample EE) *Explain the food chain that exists in any pond by means of diagram or other technique. *Explain value of each inhabitant in a pond community. *Tell the value of a local pond

*Other communities could be substituted as seashore, forest, city, pavement, etc.

Mathematics Discipline

BEHAVIORAL OBJECTIVES

OBJECTIVES	ACTIVITIES	OUTCOMES
Computes cost per person of meals	1. Visit grocery store to examine prices and packaging. 2. Read and compare prices in newspaper advertisements of foods. 3. Compute cost of a lunch, dinner, breakfast, etc. 4. View filmstrip, "Food—Fuel For the Body" 641.3 Booklet, How the Body Uses Food Supplying Food For Our Cities 641.3 5. Read Books – Dahl, Ronald "Charlie and the Chocolate Factory" Freeman M. B., Fun with Cooking, Random McDonald, Barbara, Cooking Fun, Walck Red Flannel Hash and Shoo Fly Pie, World Publ. 1965.	Given a recipe determine amount of ingredients needed per person. Given a recipe that serves the class determine the cost of serving one person.

BEHAVIORAL OBJECTIVES

OBJECTIVES	ACTIVITIES	OUTCOMES
Know and use recreational facilities in the community	* Read map, "Parks and Public Lands in Wellesley Mass." by Conservation Council to locate areas for swimming, sailing, fishing, skating, playing tennis, hockey, golf, etc. * Read "Schedule of Recreational Activities" by Park Department to note time and place. * Plan for better use of school grounds. See lesson "Looking at School Site Planning" in "Observing Our Environment" by Oregon State System of Higher Education.	The student will be able to: * List recreational activities available in Wellesley with time and place. * Identify on a Wellesley Planning Board Map -- place to swim -- place to play tennis -- place to play baseball -- place to skate * Plan a list of activities for a month of Saturdays.

COMPREHENSIVE LIST OF QUESTIONS AND SAMPLES IN ENVIRONMENTAL STUDIES

Different techniques and methods may be employed in environmental studies. Given the broad behavioral objectives and the desired outcomes a list of specific questions and samples will help the teacher direct the activities of her students for more effective learning. The list present questions that may be completed by using the samples given on any appropriate choice which fits the particular unit with which the students are involved.

Questions	Samples
What words or ideas come to mind when I say_____?	(ecology, predator, recycle)
What do you think of when you hear the word_____?	(conservation, SST, road)
Compare two or more_____	(animals, bones, rocks)
Contrast_____with_____	(topsoil-sand, frog-toad)
What are the significant similarities between_____ and _____?	(birch tree-beach tree, pen-pencil)
What are the significant differences between_____ and_____?	(trains-boats, camping-backpacking)
Differentiate between_____and_____.	(salt water-fresh water, predator-prey)
What different ways are there to solve problem X?	(air pollution, of gypsy moth)
How many kinds of problems could have arisen from situation X?	(earthquake, parking)
In this role-playing situation, how many other ways could Y have responded to the problem?	(issues at Town Meeting, airport expansion)
How many different ways can object Z be used?	(paper, glass)
Provide two or more endings to this story.	(see Case Studies)
Provide two or more beginnings to this story.	(see Case Studies)
How many different ways can you group these objects, words, ideas, etc.?	(rocks, bottle tops)
How many different patterns do you observe in this picture, song, etc.?	(geometric, growth)
How many different views can we anticipate in terms of this issue?	(paying the price of pollution)
How many different predictions can we make relative to X occurrence?	(algol bloom, drought)
How many different conclusions can we draw from this data?	(population statistics, rising costs)
How many different errors can we make in the process of _____?	(measuring the school yard, cost of a meal)
Given the following purpose and data, develop a plan to achieve this purpose.	(clean up litter)
Organize the following information into a meaningful report.	(data from written source or from direct experience)

Questions	Samples
Given the following items, construct a mobile, a collage, a picture, a diorama, etc.	(junk, nature specimens)
Combine the following simple machines into a complex one.	(pulley & lever)
Given the following arithmetic operations, construct a problem using all of them.	(multiplication & division, buying & selling)
Given the following figures and data, construct a graph.	(no. of cars bought in any major city)
Combine the following data and state the interrelationships which you perceive.	(births-deaths, sunshine-percipitation)
Describe the pattern you discovered in a design.	(leaves, fruit, flowers)
Analyze the given data and identify the facts and fallacies.	(toads-warts, ground hog effect on the length of winter)
Pupils view a film without sound and analyze film by providing their own dialogue. Pupils then replay film with sound to confirm analysis.	
Tape a lesson. Pupils listen and analyze their contributions and evaluate them to arrive at suggestions for improvement.	(take a tape along on nature walk)
Pupils observe and analyze artifacts.	(anything goes)
Pupils view a film and analyze film to arrive at the sequence of events shown in the film	
Pupils view a silent demonstration and analyze to determine what they have observed.	
What are the parts of a _____.	(flower, brain)
Describe the steps or procedures needed to _____?	(make a terrarium)
What are the essential factors involved in this problem, experiment?	(heat, water)
List the parts of X and describe how they are related.	(automobile, flower)
In solving X problem, list the steps you would take. .	(snow removal)
Given the following specific situations, objects, data, etc., what *big statement can you make that applies to all?*	(food chain)
Into what kinds of groups can you place these items, objects, ideas, etc.?	
What properties can you recognize by which these items may be separated into groups?	(size, shape, color, habits)
Using your own ideas, make up your own grouping systems and then place these items in the groups (categorizing).	
Given two or more alternatives, which one would you chose and why?	(bicycle, auto)

Questions	Samples
Given X problem and solutions 1, 2, and 3, which would you select and why?	(alternatives)
Given issue and views 1, 2, and 3, select the view you would accept. Substantiate your selection.	(pollution issues, trash)
Given the following courses of action in X situation, which one would you choose to follow? Justify your choice.	
Given the following articles reporting Z even, select the one which best describes the actual occurrence. State the reasons for your selection.	(Using Time, Life, Newsweek, etc. pick issue, i.e., SST, ABM)
Which of the following scientific inventions (X,Y,Z) was most beneficial to manking? Why?	(airplane, DDT, Polio Vaccine)
How could we measure the size of this room? Which is the best method? Why	(Use ruler, string, tape, etc.)
Make up a story solving a problem.	
Create or design a perfect world.	
If you were a _____, what would you do?	(rabbit, teacher, parent)
Change the story.	(Johnny Appleseed, Pilgrims)
Invent_____.	(depolluter, a new machine)
Imagine that_____, what would happen?	(world had no grass, moon is cheese)
What would happen if _____?	(your dreams came true, if you had a million dollars)
How would you feel if_____?	(your class went on a trip but, you had no permission to go, you had green hair)
What would you do if _____?	(the sun stopped shining, you were the last person on earth)
Give an imaginative account of _____?	(life of Kangaroo, drop of water)
Devise a system or procedure for _____?	(taking tests, losing weight)

BEHAVIORAL OBJECTIVE:

Read and interpret map.
Make maps of local environment in different schools.

ACTIVITIES:

1. Collect maps of different types and various areas.
2. Read and learn symbols, scales, grid.
3. Making a map and grid of classroom.
    a. Pick center of classroom.
    b. Identify North from that spot with eyes closed.
    c. Open eyes and check with other classmates to verify.
    d. Discuss and come to an agreement as to North.
    e. Decide on each direction to Boston.
    f. Place a child at center of room and call point (0,0).
    g. From point of (0,0) locate other thing in room using East-West from (0,0) first, then North-South distance from that reference point.
    h. Locate Teacher's desk in reference to (0,0).
    i. Locate his own desk in relation to (0,0).
    j. Place on floor or desk 12" x 18" piece of paper. Set up N, S, E, W, points on paper and move desks for comfort.
    k. Measure length and width of room and use a scale that will

    l. Draw grid based on this scale .
    m. Use this grid as a model of the floor space.
    n. Find center of grid point (0,0).
    o. Locate Teacher's desk, your desk, other desks, tables, sink, other furniture belonging to this room.
    p. Show objects on grid so that this becomes a map of room where all is visible to map maker.

Students compare maps and agree on changes to be made.
These activities will take about three class periods.

4. Using similar method with a grid construct a map (floor plan) of your school building on 18" x 12" paper.
5. Repeat for a 18" x 12" map of school grounds and building.
6. Construct a three dimensional model of school building.

Following are listed a variety of sample activities in different disciplines taken from many sources. They are specific, challenging, and fun to do.

LANGUAGE

Compose lyrics from the sounds you can hear in the natural environment. Describe what "nature" means to you.

Write poems or descriptions about something you found on a walk.

Stop in the woods and have the group, using all senses, describe the moment, verbally.

Tell stories of what was seen and listen to nature stories.

Describe the view from a given location.

As you go along, keep stopping to close your eyes and touch things -- up high, on the ground, all around. Do you like how a thing feels or dislike it? When you get back, write (or tell) about how some things felt to you. Did they feel pleasant or unpleasant? Could you tell what something was just by touch?

Write or tell a story on being an apple tree for one calendar year.

Read about, write or tell a summary of the life of one of the following: skunk, woodchuck, mole, wild rabbit, field mouse or any other animal.

Study a tree or flower closely and then write a Haiku (17 syllable Japanese verse), simple verse, short description, prose, drama.

Describe colors, textures, tastes, smells.

Describe an object while blindfolded.

ART

Take a "rainbow" trip – look for red, orange, yellow, etc. Come back and draw what is seen.

Take a discovery hike in the town forest. Sketch animal tracks located on the hike and identify.

ART (Continued)

Take along paper and magic marker or crayons. As you go along notice as many colors as you can find and mark a sample of that color (or as close as you can match it) on your paper. How does texture affect the color? How many different shades of one color do you find? When you get back, make a picture, using the colors you recorded. It doesn't have to be a picture of the woods. It could be how the woods make you feel.

Collect and identify seeds and make a design with different texture, color, size and shaped seeds.

Draw different clouds; identify; explain.

Make a study of a plot of land. Record changes with seasons through sketches.

Study changes in color, light and shadow due to different times of day, seasons. Sketch differences.

Make leaf, bark, etc. rubbings.

Make leaf prints in plaster of Paris. Make sand castings of cones, feathers, leaves.

Make colored sand painting.

Make a collection of leaves, soil, sand, moss to demonstrate texture, colors, sizes.

Make sketch before and after going for a nature walk. (First sketch made after talking about what might be seen. Second sketch made after walk. Compare.)

SOCIAL STUDIES

Find out what year your house and school were built. With other students, make a chart of how the acreage was used one year ago, four years ago, ten years ago, fifty and one hundred years ago. Why was the area used for its stated purpose?

Calculate the percentage of stated area which does not absorb water, due to roads, buildings.

Find out where your family's water comes from, where your sewage, trash, burnable wastes and garbage go

What materials are used in our area for building? Why?

Look for signs of animals and birds that will tell you who inhabits the area. Where do these animals live at different times of the year? Why? Do their habits influence the balance of nature? Do other species depend on them? Do they influence man – or he them? Do they influence man's environment, or he influence theirs?

SOCIAL STUDIES (Continued)

Evidence of man's effect on the environment.

Nature resources found in the area. History of the area, has it always been a forest, field, lake, etc.?

Find causes of pollution in your neighborhood and find ways to eliminate them.

Search for man-made changes and discuss whether they may be helpful in some ways and harmful in others (roads, fire break, etc.)

After rain, notice gullying, deltas, deposits of silt, pebbles, stones and "minigeology".

Make study of gravestones for plotting epidemics.

Count tree rings and correlate with historical facts.

Determine the age of a tree and associate with period of history past or future. Tell a story that the tree might have seen in history.

MATHEMATICS

Pace out a given distance. Compare results with others and with a standardized unit of measure.

Measure (approximately) the surface of one, average-sized leaf from a tree. Count the leaves on one branch of the same tree and estimate how many leaves on the whole tree. Then find the approximate total leaf surface on that one tree.

Select a tree and determine its age by counting branches or tree rings.

Keep weather records of temperature, precipitation, length of day, for a stated length of time.

Estimate how tall a tree is and how much it has grown each year.

Estimate height of tree (how many times taller than a member of the class).

Estimate age of live tree by counting between nodes (this works well for maples, oaks, pines).

Count tree rings and explain differences in size (due to weather conditions).

Mark out an acre, quarter acre.

Calculate the percentage of a stated area which does not absorb water due to roads, buildings, etc.

MUSIC

Sing songs about the seasons – make up new words.

Listen to sounds of nature on walk. Sing songs about nature. Make up songs about what is heard. (Bird songs, Sounds of forest. Wind in pines, wind in hardwoods. Bug sounds. Carpenter ants, bees, etc.)

Listen carefully for a sound or series of sounds as you walk along. Put them together forming a melody or part of a melody. Maybe some of these could be transcribed and combined to make a "woods song".

Listen for insect, bird, mammal sounds, record on tape.

Use imagination to reproduce sounds, rhythms by simple instruments. Instruments could be made by children – such as sticks, shakers.

Make up a song using a nature theme.

Correlate bird songs with pcitures. Also frog or insect sounds.

SCIENCE

Study pond water and identify living things.

Take and study temperature deviations in an area.

Identify animal tracks.

Plant orange, apple, grapefruit, etc. seeds. Grow new plant from parts as leaf, stem, bud.

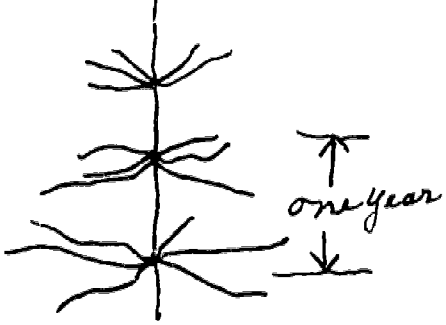
Study weather's effect on environment.

Find evidence of erosion. Discuss ways of curtailing it.

Choose one animal and tell the kind of habitat it needs – food, shelter. Why must it live where it does?

Watching plant roots growing, testing soils for chemical percentages, studying different types of rocks.

Test soils for composition, acidity, etc.



Determining the age of some conifers, especially white pine: (White pine is identifiable by its having 5 needles growing in one "clump" or bundle. Every year a white pine grows up, it also grows out, by its buds forming a sort of wagon wheel arrangement. Therefore, it is possible to determine the age of a white pine by counting the spaces between whorles of branches. Each space represents one year's growth.)

Activities to incorporate this information: Compare the height of the tree with the students. How high was the tree when it was their age? Do we grow the same way? Was there the same amount of growth each year?

Determining the age of a twig and general twig studies: On most twigs there is one large central bud at the tip of the twig and one or more smaller lateral twigs. The large terminal bud bursts in spring and is responsible for the twig's lengthening. The lateral buds usually result in leaves or twigs, or flowers. Encasing the large terminal bud are protective bud scales. When the bud bursts, the scales fall off, leaving scars that look like rings of little lines around the twig. There is such a ring of scars at the beginning of each year, therefore, the distance between two scar rings represents one year's growth. It is often possible to count back several years before thickening and bark obscure the scars. Activities to incorporate this knowledge: How old is the twig? How long was it in (1965)? Is there the same amount of growth each year? What could cause the variations? (Amount of light, water, etc.) Are all twigs the same? Take some twigs in the early spring and force them. Which ones unfurl first, last? Is this the same rate as happens outside and so on. See "How to be a Twig Detective". (Audubon Publication)

Miniclimates: Using several thermometers, take the temperatures of several different areas (blacktop, grass, shade, water, soil) in bright sunlight being sure to shade the bulb from direct light. There will be variations. Why? One difference may be the variation in color. Dark objects tend to absorb more heat, light objects to reflect it. It is interesting to realize that what we feel is really only the average of many miniclimates around us. However, smaller animals and plants are exposed to rather radical differences in climate in their daily lives, being close to the surfaces that vary in temperature. Activities: If you were a tiny person living on blacktop, how would you dress? On grass, etc. Based on your findings, can you decide if it would be better to drive a light or dark car in the tropics?

Succession studies: Plants in a certain place influence and are influenced by the place they live. They may change that place slightly, allowing for another plant with different demands to live there. The change in habitat resulting in a change in plant cover (and vice versa) is known as succession. Study the blacktop and other areas of the school ground. What's happening? In cracks, notice the toeholds that some plants have gained. If the area were left completely alone, what might eventually happen? Are there signs of weathering? How many different kinds of plants can you find in the cracks?

Looking at forest floor litter: Dig down carefully. What do you find at the surface? How deep can you go before the upper materials start disintegrating? Is there a distinct layer between what you'd call "ordinary" dirt and the litter on top? How deep do small plant roots go? What kinds of inhabitants does the forest soil have? Can you find any seeds on top? How many per square (yard)? Where did they come from? Why are there so many/few? Set up a Burlese funnel. * See following pages.

Looking for animal signs: Can you find where a squirrel has "peeled" a cone like a banana to get the seeds? Are there any tracks around? Droppings? Holes in trees? Who might live there, when, why?

What can you find in tree bark? Compare different trees for texture, color, smell. What might be growing on the tree? (lichens, moss, fungus). Make bark rubbings by placing a heavyish sheet of paper against the tree and rubbing a crayon across it to pick up the pattern of the bark. Or, make clay imprints by pressing a piece of clay against the side of the tree. Can these be made into finished designs? What insects can you find hiding under the bark without peeling it off? How many in a square (foot)? How many different colors can you find in the bark?

Making a senses census: Considering each of our senses, begin to develop each as fully as possible. How many colors of the rainbow can you find growing naturally? Can you find 4 shades of green/brown? Find something that is fuzzy/sharp/soft/hard/round/square, etc. Taste peppergrass, sassafras, wintergreen. What does Queen Anne's Lace root smell like? Wintergreen? Sassafras? What does dirt smell like? And so on. How many sounds can you hear in two minutes?

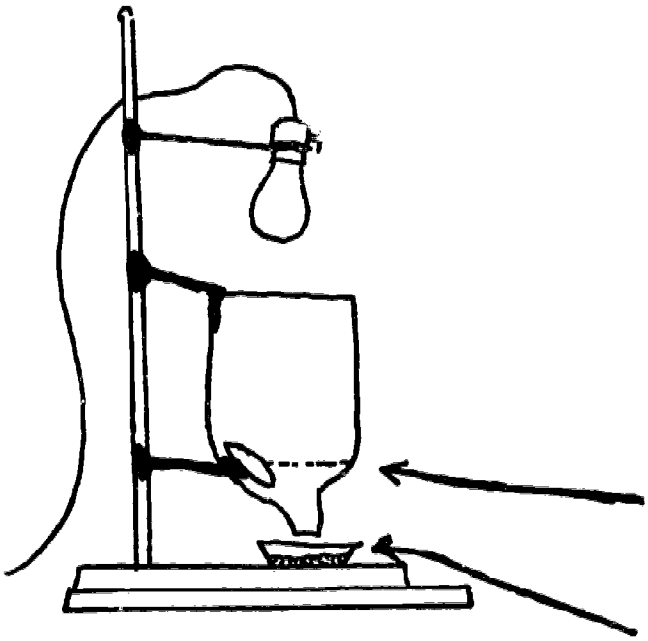
How big is an acre? An acre is roughly 40,000 sq. ft. (approximately 200 ft. per side). Ask the students to see if they can walk off 200 ft. from a fixed point. Ask them to leave a shoe or other marker for their estimate. Using a surveyor's tape measure, measure off 50 ft. in some other direction. They may use this to estimate, without touching the tape. Some will decide to pace, discovering how many paces in 50 ft. (times 4 for 200 ft.) Again, let them estimate 200 feet. They may change the original measure. Measure 200 ft. with the tape. Who's the best guesser? From there, mark the corners and measure off a full acre. Have the students stand around the boundaries to get the "feeling" for an acre. Why this exercise? It gives practice in estimates, makes the concept of an acre real. Knowledge and size of an acre is helpful when discussing land use and zoning.

A scavenger hunt is an enjoyable way to determine the students' awareness of their surroundings. It is also a good measure of how much lesson material has been retained. Emphasis should not be on collecting so much as on good observation and communication of what they have found.

1. Make a bark rubbing of a tree and label it.
2. Draw an evergreen ' bundle". Identify it.
3. Draw an insect (ant) that you find.
4. Mimic a bird song.
5. Collect four different shades of brown or green found in nature.
6. Find one piece of man-made litter.
7. Find one piece of nature's litter.
8. Collect 3 different seeds from the ground.
9. Collect one leaf from an "opposite" tree from the ground.
10. Collect one leaf from an "alternate" tree from the ground.
11. Find an animal sign.
12. Find something fuzzy.

MODIFIED BURLESE FUNNEL

A method of discovering the kinds and numbers of small animals that inhabit the soil. It is difficult to make a full search simply by sifting the soil. This method is based on the idea that soil animals inhabit soil areas most suitable to them and tend to migrate when the conditions change.



Materials:

Large plastic bleach bottle and piece of wire screening -- ¼" mesh. Light bulb, socket and plug wire. Ring stand or other supportive arrangement, clamps.
Small jar containing alcohol.
Sample of soil from forest floor, field or other area.

Procedure:

Remove the cap and the bleach bottle bottom.
Invert it and attach to the stand as shown.
Place the piece of screening in the bottle across the pour hole.
Attach the light bulb above and place the jar of alcohol below the hole.
Place the soil sample carefully in the funnel.
Turn on light and let stand for 24 hours.

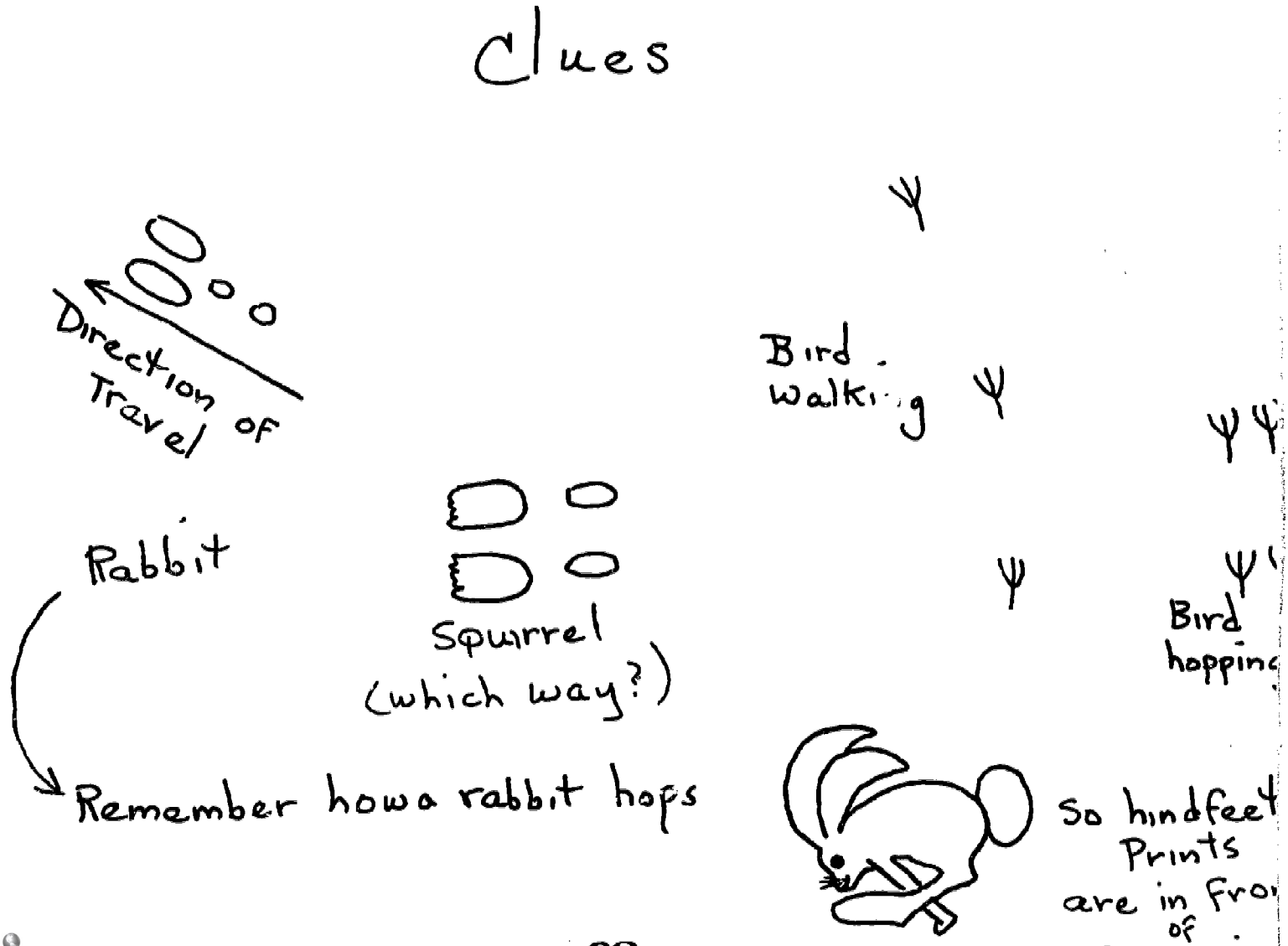
The light dries out the soil from above and the soil animals dig deeper to avoid drying out, eventually dropping out the hole and into the jar of alcohol. They are thus instantly preserved for study. You may not wish to kill them, but is difficult to keep them alive once they have left the soil.

For the best display, put your finds in a glass-bottomed dish on an overhead projector. In this way the entire class can see the animals and their relative sizes.

Possible discussion questions: What do the creatures need to live in the soil? How are they adapted to soil living? Why did they leave the soil? How many are there per cubic foot? What role do they play in the soil (aeration, decay, food sources). A good reference:

Soil Animals, by F. Schaller;
Ann Arbor Science Paperbacks, ANN ARBOR
U. of Mich. Press 1968

5. Find ANIMALS AND ANIMAL SIGNS
   a) Watch for chipmunks and other mammals and birds. Where do they live? What do they eat?
   b) Find holes and tunnels in the ground, grass and trees.
   c) How do earthworms travel? How do they feel crawling on your hand?
   d) Sprinkle sugar and watch what comes. Put up a birdfeeder.
   e) Find mice runs in tall grass.
   f) Follow tracks -- where were they going? Which direction? Can you make up a story?



SUGGESTIONS FOR EXPLORING THE SCHOOLYARD

1. Emphasize the SENSES
   a) Have the children lie on their backs in the grass quietly for five minutes. What do they hear, smell, see?
   b) Have them lie on their stomachs and do the same.
   c) Use hand lenses to discover.
   d) Collect various shades of colors growing naturally, various colors, shapes, textures.

2. Use the LAWNS
   a) Mark off a square foot of lawn. Count the number of plants in it. How many different kinds? Compare with an equal area of sandier, poorer soil. Discuss the differences.
   b) Dig up clover roots and look for bacterial nodules.
   c) Watch an active ant hill. How do they dig the hole?
   d) Search for worm castings. How many do you find in a square yard? Discuss the important role of worms in soil formation.
   e) Are there grass flowers, seeds?
   f) Record temperatures on various places in and on the lawn. Compare with temperatures on blacktop. Are there differences?

3. Use the SHRUBBERY AND TREES
   a) How many different kinds of evergreens can you find?
   b) Can you find berries? What are they good for?
   c) Has anything been nibbling on, or using the leaves?
   d) How do leaves grow on a branch? Are they arranged the same?
   e) How do new leaves feel compared with old leaves?
   f) Does all bark look and feel the same? Make bark rubbings?
   g) Can you hear tree branches rubbing in the wind?
   h) Look for leaf "skeletons". Why and what do they mean?

4. Use the BUILDINGS, WALKS AND DRIVEWAYS
   a) Look for algae, and lichens growing on the bare surfaces. Why do they grow there and how?
   b) Study some ivy (a safe kind). How does it cling to the wall?
   c) Look for signs of weathering and erosion (rust, corrosion).
   d) Look at stones in a wall. Compare textures, color, shine.
   e) After a rain, find minature deltas, rivers, valleys. See how they form.

JAPANESE PARCHMENT PROCESS

Here is a method of preparing "parchment" that is simple enough for a kindergartener to do, yet gives truly elegant results.

Materials:
- Roll of white freezer paper (available in super markets)
- Bottle of white glue
- Paint brush with bristles trimmed to a flat edge
- Green or dried grasses and plant material
- Box of tissues

Procedure:

Mix a solution of 1 part glue to 2 parts water in a jar.

Place a piece of freezer paper on the table, matte (non-shiny) side up.

Arrange plant materials artistically on the paper.

Peel the tissue into its plies and shred the edges slightly so there are no straight edges.

Cover the entire arrangement with the tissue paper.

Dipping the brush into the glue mixture so that it is dripping wet, tamp down the entire arrangement plus tissue until the tissue and plant materials are completely stuck to the paper.

Press out air bubbles, but don't worry about the myriad small wrinkles that will have resulted from the tamping.

Should you rip the surface in the process, simply shred a small piece of tissue and tamp-glue it over the hole – invisible mending.

Let the creation dry for 24 hours, then press it under six volumes of the encyclopedia for another 24 hours.

When dry and pressed, the paper will resemble parchment, especially as it begins to yellow and look ancient.

Thanks to Mrs. Ilonka Larant, Bedford, Massachusetts

MAKING AN AQUARIUM SLIDE

Materials needed:

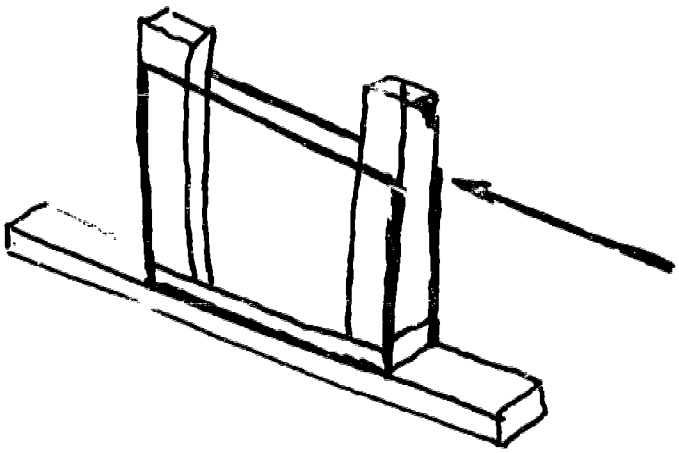
(2) 2" x 2" glass photographic slide covers

(3) 2" pieces of 1/8" balsa wood

(1) 6" piece of 3/16" balsa wood

tube of water-proof glue, which adheres to wood and glass

Procedure:



1. Cover all surfaces of the balsam wood sticks and let dry for a few minutes

2. Glue the 3 small pieces of balsam wood to the two pieces of glass (see left) forming a very narrow "aquarium" that is open at the top

3. Trim excess wood to level of glass edge with sharp knife.

4. Glue the aquarium to the 6" piece of balsa wood and let dry undisturbed.

Using the slide:

This will fit most film strip projectors when the film carrier is removed and most older slide projectors.

Fill the slide cavity with water you have gathered from a pond, making sure to include some of the larger critters you can see. Use a spoon or an eye dropper to do this. Insert the slide into the projector and focus on a screen or on the wall. You will be able to see the tinier, darting dots of water fleas and cyclops, as well as the gill movement of larger damsel and mayfly larvae.
CAUTION: Do not leave the slide in the projector for too long lest you parboil the little devils.

Vibrating Air Columns:

Water Whistle – a straw partly cut in two and bent at the cut with one end emersed in a bottle with water in it makes a musical note by gently blowing through the horizontal straw and raising and lowering the other part in the water. (Illustration 1)

Straw Oboe – a straw with one end flattened (which acts as the double reed as in an oboe) and blown into, makes a crude musical instrument. To get various notes, cut straws to different lengths.

Tuned Bottles – Arrange bottles and jugs filled with water at different levels. Tune the bottles to a scale by varying the amount of water. Mark levels so they may be tuned again easily. Play a tune by tapping or by blowing across the top.

Rubber Band-jo – use various sizes of rubber bands (length and thickness) stretched over a cigar box or milk carton (with a rectangle cut from one side leaving 1/4" margin for rigidity along either side and a wooden stick tacked across opening to brace the sides). Put eight rubber bands around the carton equally spaced. The pitch of each band may be raised or lowered by tightening or loosening the band across the opening. Tune the eight strings to a scale. Make two instruments to play duets. (Illustration 3)

Wishbone Harp – save the wishbone from your chicken or turkey dinner for a tiny wishbone harp. String a small thin rubber band across the opening. Wind the band over several times if necessary. Rest the open end of the wishbone on a piece of wood or empty can and pluck it gently. (Illustration 4)

Bass or Contralto Bucket – all you need is a large metal wash tub, bucket or large juice can, broomstick, a length of heavy cord or venetion blind cord, and an assortment of hardware – an eye screw, two washers, and a nut. Turn the tub upside down. Drill a hole through the center large enough to fit a large screw eye. Cushion the screw with a washer and thread it through. On the inside of the bucket put on another washer and tighten with a nut. Bore a hole in the end of the broomstick or a 3' piece of doweling, and attach with wire to the rim of the bucket through which a hole has been bored. At a convenient height near top of stick, drill a hole large enough so that the cord can pass through. Tie one end of cord to screw eye. Thread other end through the hole in the stick. To play your bass, stand with one foot on bucket and hold stick with your left hand and pluck the string with your right. This will be the lowest note. To vary the sounds, hold the stick and string and move hand up and down. For the contralto bucket, hold between knees, and tilt stick and pluck string. (Illustration 5)

"Panbourine" – with a sharp nail, punch 6--8 holes about a rim of a tin pie pan or foil plate. Cut an equal number of 3" pieces of thin wire. For each hole you will need two metal discs -- bottle tops. Remove cork or cardboard linings, and punch a hole through each cap. Thread them with the wires and attach them in pairs through the holes in the pie pan. Knot the wires at each end. (Illustration 7)

"Coconut Shells Shaker" – drill a hole (at least 1" in dia.) so coconut meat can be taken out. Fill with seeds, plug hole with tape and shake. (Illustration 8)

"Coconut Shells Clappers" -- saw a coconut in two equal halves. These are good to imitate sound of hooved animals. (Illustration 16)

"Coconut Shells Scrapers" – place paper over the two coconut shells and rub together. (Sounds a little like walking through the snow) (Illustration 16)

"Walnets Castinets" – made from perfect halves of walnuts. Drill two holes about 1/2" from edge of each half of the shell. (Illustration 15)

"Box Shakers" - use wooden codfish box, shoe polish box, baking powder box, or oatmeal cylinder. Put a number of seeds, (rice, cherry pits for example) inside and shake. (Illustration 9)

"Rhythm Sticks or Claves" – use a 6" long piece of 1" dia. maple or old broom handle. To play, cup one in your hand and hit it across the top with the other. (Illustration 10)

"Bones" – turkey leg bones for rhythm sticks or claves. Beef ribs (minstrel bones) to click, soup bones to string and click together. (Illustrations 11, 12 & 13)

"Xylophone" – maple sticks of various lengths and diameter can be strung on a string or set on two tubes of rolled-up newspaper. For best resonance, drill holes at 1/5 distance from end of each stick. (Illustration 14)

Guiros or Notched Stick" – choose a branch or a piece of scrap wood about 1" in dia., and 12" – 24" long. Whittle open notches half an inch wide, spacing them every half inch or so. A metal tapper or chopstick produces the sound by being scraped across the notches or grooves. (Illustration 17)

"Drums" - drums can be made from a variety of simple materials -- nail kegs, waste baskets flower pots, wooden chopping bowls. For the head use a calfskin, rubber inner tube, cloth which has been stretched and shellacked. Calfskin (from a drum shop) must be soaked in water 20 minutes, stretched over container and held down with upholstery tacks. Put first tack then the second on opposite side. Alternate until tacks are 1" apart. For flower pots or other non-wood forms, use cord or leather thongs to tie the head in place. (Illustration 18)

SIMPLE INSTRUMENTS TO MAKE OF SOLID WASTE

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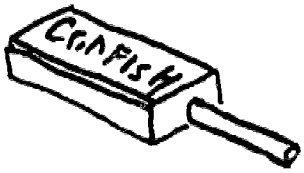

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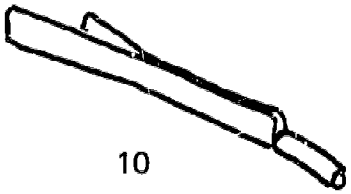

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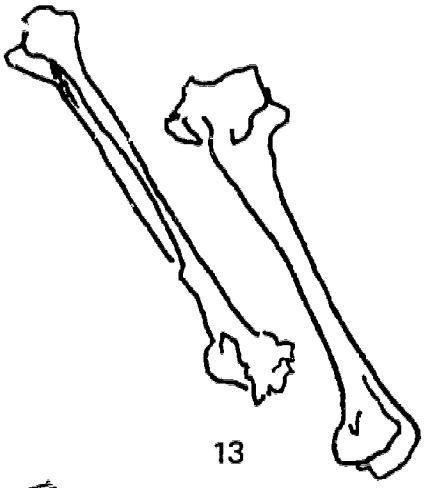

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SAMPLE ANIMAL STUDY – PRIMARY LEVEL

Questions children ask:

What is it? Is it alive? What is it doing? Why? Where did it come from? How does it work?
Can it run? sleep? eat? etc.
Can I have one? (it - some - one of the puppies, etc.)

Knowledge children should acquire:

1. Living things depend on their physical environment, and are affected by it.
   Experiences: micro-climates in the classroom, on the school grounds, in little blocks of life; soil studies on school grounds; weather studies on school grounds; water cycles
2. Living things depend on each other, on other living things, on green plants as food producers and oxygen restorers.
   Experiences: plant-animal interrelationships on school grounds; energy cycles; food chains; photosynthesis; symbiosis; in social studies context, human food sources, clothing sources, division of labor in communities.
3. Change is a factor in the living world.
   Experiences: change of seasons on school grounds; life cycles; maturation of organisms; effects of invading organisms; maturation of communities, as forest succession.
4. Characteristics of living things; metabolism; reproduction of type (species); limits of growth patterns.
   Experiences: Life cycles.

Skills Children should acquire:

1. observation, using all senses.
2. accurate recording of observations
3. evaluation of boserved phenomena
4. confidence in own ability to observe and evaluate
5. recognition of alternatives in meeting problems
6. rational approach to selection of alternative, as opposed to emotional approach

The following samples may serve as a guide for the student as he observes an animal in his particular habitat

Questions:

1. How does the specific animal live from day to day?
2. What are the geographical characteristics of the area in which he lives?
   a. How does he get his food?
   b. What aspects of his surroundings are essential to his daily living?
   c. What role does instinct play in his survival?
   d. What other animals live in this particular area? What is their relationship to the species about which the book is written?
   e. Who are his friends? His enemies?
   f. How does he protect himself and his family from enemies?
3. Has the animal's survival been threatened? How?
   a. By natural forces?
   b. By man?
   c. Can he survive these threats? How?
4. What do you think might happen if man tampers with the animal's natural environment? What measures might be taken to prevent this?

FURTHER SUGGESTIONS

1. Individuals, teams or groups may prepare a replica of the habitat described in books. This may be done in a shoe box or other cardboard box using papier maché, clay, construction paper, etc. Each box may be placed around the classroom, representing the thirteen zones within the United States. Other classes may be invited to tour the mini-U.S. within the classroom.
2. The student may parepare a chart depicting the life cycle of the animal.

THE ECOLOGY OF OUR PARTICULAR AREA

What animals live in the area around our school? What do we really know about them? How do their lives affect other animals? How do they eat, bear young, raise young? What aspects of our environment are essential to their survival? How do their lives affect us?

What has happened in our area that may be upsetting the balance of nature here – housing development? industry? highway development? water resources?

A FIELD WALK

Observe all living things today.

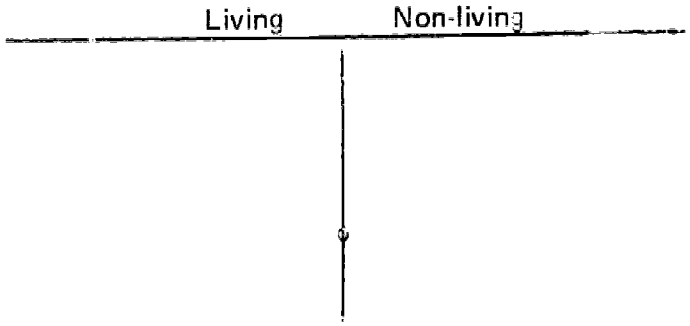
List under the correct columns all producers, primary consumers, and secondary consumers you see.

Super Snoopers will find at least fifty!

Producers	Primary Consumers	Secondary Consumers

SIFT AND SORT SOME SOIL

1.



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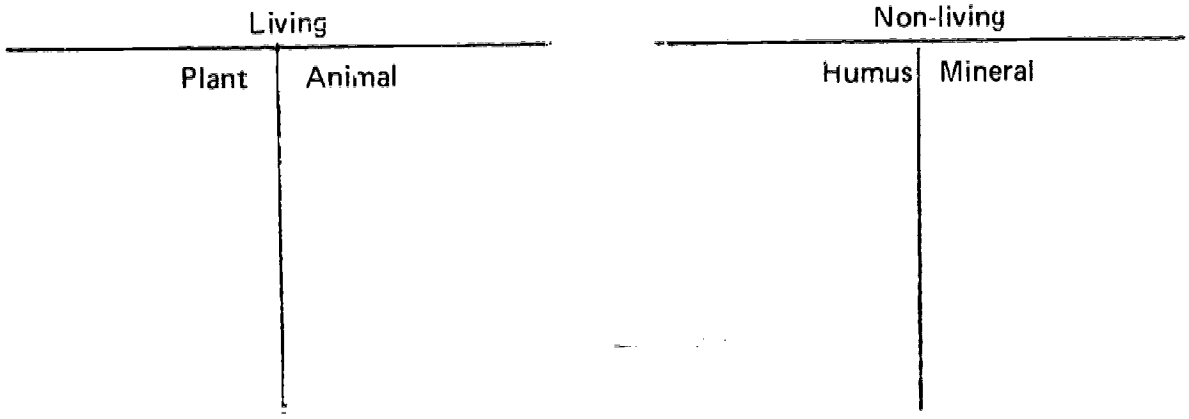

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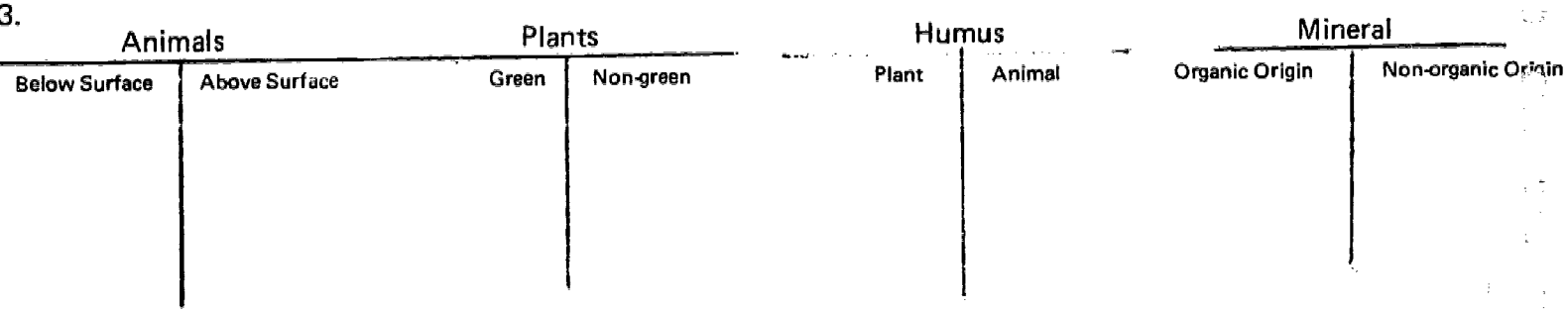


ARCHEOLOGY

You are an archeologist from Twin-Earth in another galaxy. This is your first exploration of Earth to look for evidences of man's presence at _____.

List the things you find that prove MAN WAS HERE!

Findings	Your Explanations

What do you think the future of this site will be? _____

QUEST CARD

INQUIRY

ACTIVITIES

DISCOVERY

EA6

BARNARD'S GRANT

1. The Town of Barnard, located twenty miles from Central City, in the county of Lafayette, in the state of Madison has a population of 25,000 people.

2. Barnard encompasses 7,000 acres of land, of which 500 acres are warm water ponds and brooks.

3. A superhighway cuts directly through the center of town in an east-west direction and overpasses two county highways that run in north-south directions.

4. Two main bus lines and six taxi cab companies service the town.

5. Running parallel just to the north of the super highway is the W and B Railroad (W&B R.R.).

6. Many of the poeple in this residential community use these transportation facilities to commute to and from their place of employment in Central City and surrounding areas.

7. Barnard has an excellent centrally located shopping center, some light industry and a growing complex of service oriented branch offices whose main offices are in Central City.

8. There are two theaters, two bowling alleys, ten tennis courts, two private golf courses, many clubs as well as two public beaches and a small boat launching are on Eagle Lake.

9. Barnard has a representative town government headed by five Selectman elected by the voters.

10. The Selectmen appoint the Comptroller, Town Counsel, Treasurer, Tax Collector, Town Forest Comissioner, Art Commissioner, Conservation Commissioner, Historical Commissioner, Retirement Board and a Constable.

11. Elected officials include a Town Clerk, a Seven-Member School Committee, a Board of Assessors, A Board of Health, a Recreation Commissioner, a Parks and Tree Commissioner, a Board of Public Works, and a Town Moderator.

12. The Moderator appoints people to help him: the Advisory Committee, Improvement Co-ordinating Committee, and Industrial Development Committee, and other various ad hoc committees as needed. For Town Organization see chart.

13. There are six elementary schools of about 500 students each, two middle schools and one comprehensive high school.

14. Layfayette State College is located in the southeast area of town.

15. A gift, a one hundred acre lot of land, has been willed to Barnard, by an old time resident, Jeremiah Dodge.

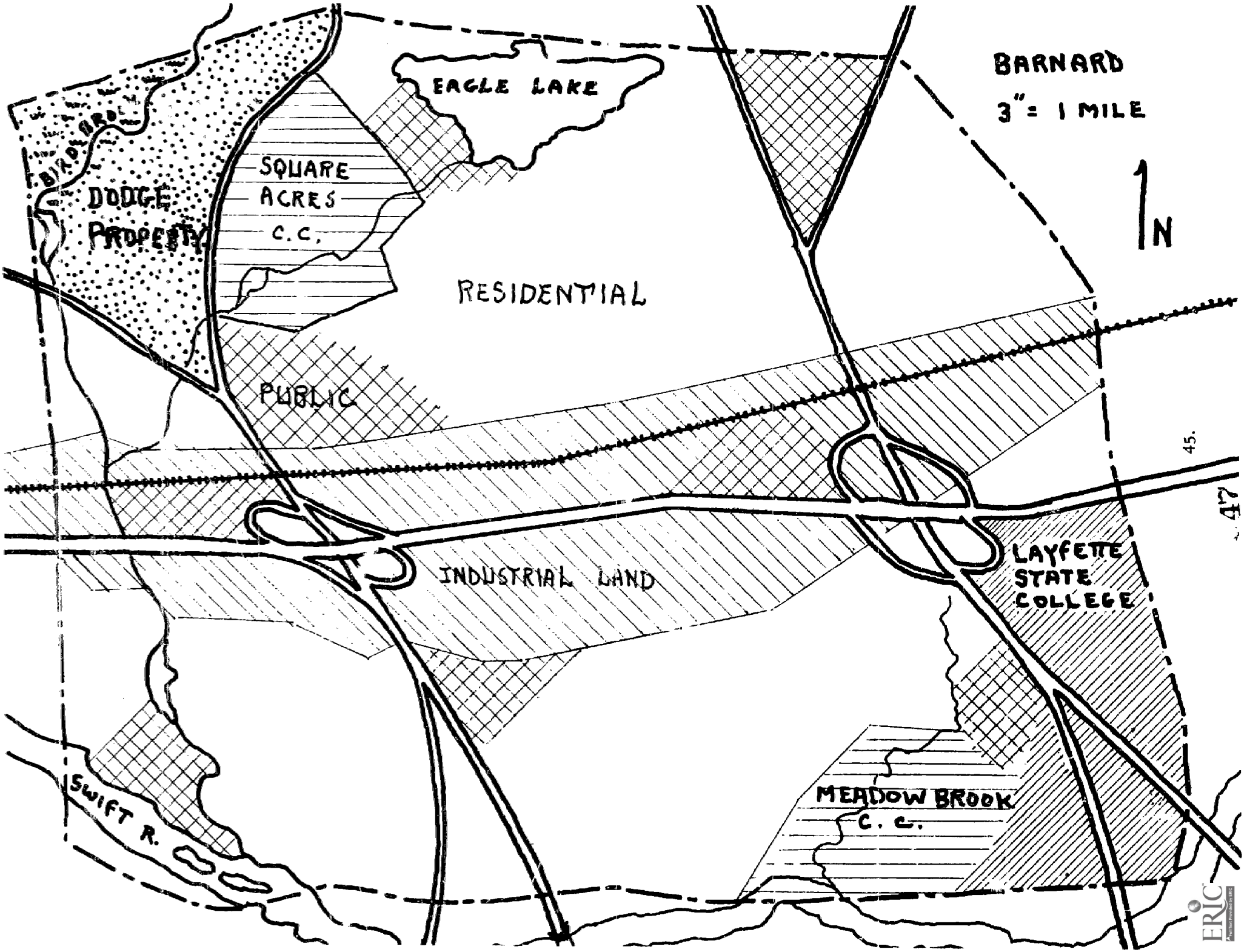
16. The acreage is situated in the northwest corner of town.

17. Approximately half the lot is made up of undeveloped woodland, and the remainder is meadow and marshland.

18. A brook flows from the high area in the northeast corner to an eleven acre pond in the southwest corner of the lot.

19. Broken stone walls on the property and remains of a stone cellar foundation give evidence of a former farm house and barns.

20. The Moderator has called a special open Town Meeting to which all interested citizens have been invited to help decide on proposals put forth for the best use of this gift lot of land.


BARNARD
3" = 1 MILE
N
EAGLE LAKE
SQUARE
ACRES
C.C.
DODGE
PROPERTY
RESIDENTIAL
PUBLIC
INDUSTRIAL LAND
LAYFETTE
STATE
COLLEGE
MEADOW BROOK
C. C.
SWIFT R.
45.
47

DIRECTIONS FOR THE STUDENT

1. Read fact sheets about Barnard and the gift lot.
2. Decide on a role you would like to play as a citizen of Barnard. Give yourself a name, a family, a career.

   You may wish to be:

   * a Moderator, who will conduct the town meeting
   * a professor, who teaches biology at Lafayette State College
   * a contractor who wants to build low income housing and housing for the elderly.
   * a game warden, who is concerned about the growing pollution problem.
   * Mrs. Nobudua, who would like to build a nature trail for nature study.
   * Mr. Dugood, a young lawyer who is politically minded.
   * Mr. Hexacre, who is concerned about housing for the growing number of retired people.
   * Mr. Goalsworthy, the high school hocky coach who desparately desires an ice rink closer than Central City.
   * Mr. Jones, president of Barnard Trust Company
   * a member of Barnard Rod and Gun Club.
   * a member of the Barnard Historical Society.
   * a member of the Garden Club.
   * a member of the Square Acre Country Club
   * a member of the League of Women Voters.
   * any of the people listed on the fact sheet.

3. On the basis of the information given and your interest, how would you like to see this lot of land used? Plan to come to Town Meeting to put forth your own ideas and to justify your position on this issue.

BARNARD'S TOWN GOVERNMENT

The administrative officials of Barnard are lead by the Board of Selectmen. The Selectmen act as agents of the town and meet every Monday. They represent the town and represent it before officials of the Federal, State and County governments, and the State legislature. They may, in the case of need, declare a state of emergency at which time they are empowered to marshall all the resources of the community and take charge of all town departments to co-ordinate efforts in restoring conditions to normal. The five selectmen are the chief administrative officers of Barnard. They are charged in the By Laws to "supervise all matters affecting the interests or welfare of the town," so they exercise considerable influence over town policy. The selectmen also appoint the Town Counsel, the Comptroller, the Treasurer, Tax Collector, Town Forest Committee, Art Commission, Conservation Commission, Historical Commission, Retirement Board and two Constables.

This would appear, to the casual onlooker, to constitute the power structure of Barnard. However, one must look at other officials in the town who are elected and have the power to appoint various committees. Because of the rapid growth of this town, true democracy has given way to 250 elected town meeting members. The School Committee (seven members) makes only one appointment and that is the office of Superintendent of Schools. Three people are elected to the Board of Assessors, but make no appointments. The Planning Board has five elected members and makes no appointments. Three people are elected to the Board of Health and appoint a public health director and an animal inspector. (This animal inspector should not be confused with the dog officer who is appointed by the Selectmen). A five member recreation commission is elected and appoints a recreation superintendent. The Board of Public Works ahs three elected officeals who appoint one superintendent of public works, a town engineer and these people in turn supervise the Highway Division, Park Division, Sanitation Division, Engineering Division, Water Division, Electric Division and Sewer Division.

The Barnard voters also elect for a one year term a moderator. He is elected to an unpaid position. The moderator, by State statute, presides at town meetings and regulates the proceedings. His function is to conduct the meeting so that the rights of individuals and minorities to be heard is protected, and at the same time the majority is able to get action.

The moderator's ruling on matters of parliamentary procedures are final. However, if seven or more voters immediately question his declaration of a vote, the law requires the moderator to verify it by polling the voters or by dividing the meeting.

The moderator is given extensive power to preserve order, including the power to order the removal and confinement of any person who persists in disorderly behavior.

The moderator exercises great influence in Town affairs because it is his duty to make appointments to standing and special committees. The efficient operation of the Town and the direction of its development depends to a great extent on his success in selecting competent and qualified citizens to serve on these committees. He is an ex-officio member of the Town Meeting and may vote.

The moderator has the power to appoint a fifteen member advisory committee. Each member serves a three year unpaid term. The terms are arranged so that one third of the membership is appointed annually. They select their own chairman.

The services of the Advisory Committee to the town are invaluable. It is required by law to consider every matter that is to be brought before a Regular or Special Town Meeting under the articles in the warrant. It consults with each Town Department, scrutinizing its budget, and sometimes modifying proposals as the individual budgets are considered with relation to the entire financial picture of the Town. It holds public meetings and sends its printed report and recommendations to all households at least seven days before Town Meeting. Reasons for the recommendations are given, and a minority report is sometimes included.

At each Town Meeting the Chairman of the Advisory Committee stands ready to give its recommendations for action on each motion that is presented.

The Advisory Committee is empowered by statute to make transfers from the Reserve Fund to provide for extraordinary and unforseen expenditures that may become necessary during the year. Thus, emergencies not contemplated at the time of the budget appropriations may be met in many cases without calling a Special Town Meeting.

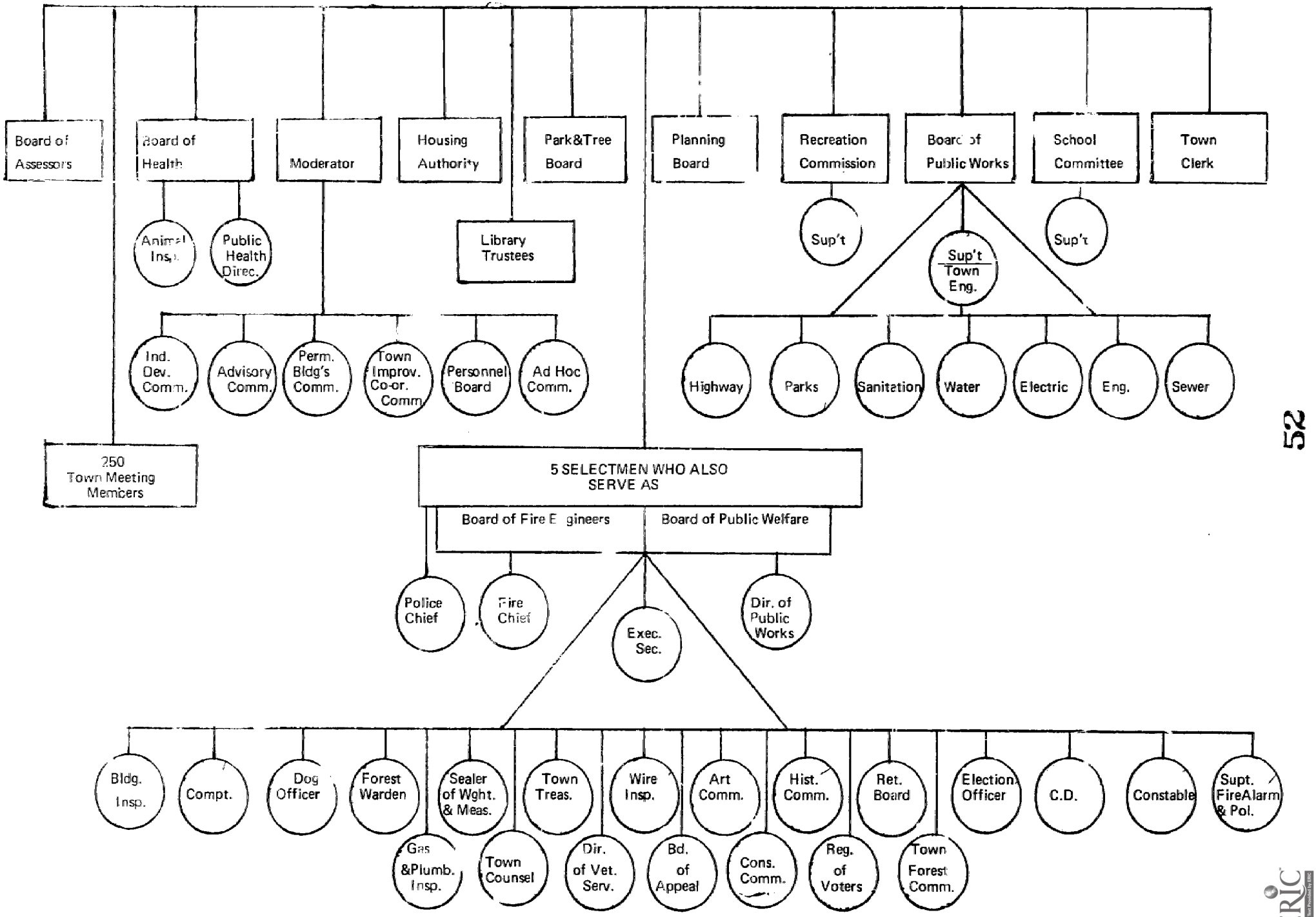
The Improvements Co-ordinating Committee is appointed by the moderator also. This committee was established in 1946 "to consider the planning, co-ordination, financing and timing of public works or improvement by the town," and to make annualiy a written report to the town before February 28. It is a long range planning committee for the financing of major capital improvements wanted by the town. It does not pass on the desireability of suggested new Town capital improvements or their priority. The report of this committee is customarily filed with the report of the Advisory Committee and contemplates capital improvements in light of the Town's tax base, revenue surplus, and debt structure,

and recommends to Town Meeting Members methods of timing and financing construction. The committee has also general concern for the long range financial stability of the Town, particularly with the level and terms of Town debt.

The moderator also appoints five members to the Permanent Building Committee, five members to the Personnel Board and five members to the Industrial Development Committee who guide and plan for the expansion of small industries and encourage other businesses and companies to open branches in the town. This will help alleviate the tax burden. He also may appoint special committees.

New England Town government could not possibly function effectively or as democratically as it does if it were not for the work of many hard working committees of citizens. The town creates Special Committees for a variety of purposes such as the selection of school sites, the planning and building of schools or other public buildings, and the study of special problems of concern to the Town. These committees are appointed by the moderator.

BARNARD TOWN GOVERNMENT



ROBERT'S RULES OF ORDER

The town meeting or hearing should be conducted in an orderly fashion by the moderator. Robert's Rules of Order should be followed particularly during the discussion and in any voting that takes place.

All members of the group have the right to express their opinion, provided that they are recognized one at a time by the moderator and rise to address the group.

Should a member wish to make a proposal, he should place it in the form of a motion -- "I move that . . .". The motion should be "seconded" by another member. The moderator should then ask if there is any discussion, restating the motion so that it will be clear to everyone present.

A motion can be changed or amended with the permission of the person who first made the motion. This person can also withdraw his motion.

A motion can be tabled or postponed for discussion.

The chairman or moderator can appoint a committee to study the motion and report back to the group at a future meeting.

No other business can be taken up until some action is taken on the motion on the floor.

When voting the majority of votes carries the motion. The moderator usually does not vote unless there is a tie. His job is to maintain order, recognize the speakers, and see that everyone who wants to say something is given an opportunity.

GLOSSARY

Adaptation, adjustment to environmental conditions.

Algae, the simplest kind of green plants, usually growing in water or damp places.

Atmosphere, the gases that surround a planet.

Bacteria, one-celled, microscopic plants that look chlorophyl; some types cause disease.

Balance of nature (natural balance), the tendency for the numbers of organisms in an undisturbed community to remain the same.

Biodegradable, organic substance that is quickly broken down by normal environmental processes.

Biome, a large geographical area of more of less uniform climate, usually identified in terms of its "climax" vegetation.

Biosphere, the region in which life on our planet is possible.

Camouflage, give a false appearance to or in order to conceal.

Carbon Cycle, circulation of carbon from carbon dioxide in the atmosphere into sugar by photosynthesis in plants, synthesis of more complex organic compounds in plant and animals, and the return by respiration or death and decay of plants and animal tissues to carbon dioxide.

Carnivore, any organism that eats animals.

Carrying Capacity, the number of species for which a given area can provide the essentials of life.

Chlorophyll, green coloring matter in plants; essential in the process of photosynthesis.

Climate, average of weather conditions over a long period of time in a large geographical area, or determined by air pressure, heat, wind, moisture.

Climax Community, a self maintaining group of interrelated and interdependent plants and animals.

Community (biotic), an interrelated and interdependent group of plants and animals.

Commensalism, a one-sided relationship whereby two organisms live together with only one deriving benefit, but with little or no harm inflicted on the other.

Compost, a mixing of garbage and degradable trash with soil in a pile. Bacteria in the soil cause decomposilum and thereby return desirable organic material back to nature.

Conservation, using natural resources in ways that restore them, prevent their waste, and help keep the numbers of organisms in balance.

Consumer organism, organism that gets its energy by feeding upon other organisms.

Cycle, a series of steps or changes which are repeated again and again.

Decay, a reduction of the materials of plant or animal bodies to simple compounds through the action of bacteria or other decomposers.

Dependence, a relationship between organisms in which one organism receives benefit from the other, not reciprocal.

Dichotomy, a division or the process of dividing into two especially mutually exclusive or contradictory groups.

Diversity, a condition or state characterized by many different kinds of plant and/or animal life in a given area. It is also a measure of the variety of plants and/or animals in a given area.

Dominant, referring to a plant or animal, or a group of plants or animals, having the greatest influence in a given environment.

Ecology, study of the relationship of living things to each other and environment.

Ecosiptem, a recognizable unit of interrelated and interdependent living and non-living things in which the materials of life are used over and over again.

Effluent, a discharge from an exit that is relatively self-contained, such as an industrial smoke stack, nuclear power plant thermal plume, or a sewage treatment plant: generally carrying pollutants.

Energy Flow, the flow of energy from the sun (the source of all the Earth's energy) through plants and then through animals which consume the plants and whicha re, in turn consumed by other animals (See "Food Chain")

Environment, the sum of living and non-living things in a given area, including plants, animals, people, air, water, and soil.

Erosion, the detachment and movement of particles of the land surface, by wind, water, ice, or earth movements such as landslides and creep.

Eutrophication, an aging process that accurs to aquatic ecosystems naturally over a long period of time. Nutrients entering the water support an increasingly dense growth of aquatic life, which depletes the oxygen supply. In turn, the body of water progresses from lake or pond to swamp, marsh and meadow Eutrophication can be accelerated by excessive nutrient enrichment resulting from man-made fertilizers, detergents, and human and animal wastes.

Evaporation, process by which water is changed from a liquid to a gas.

Food Chain, a series of organisms, starting with a green plant in which one organism feeds upon the one before it in the series.

Food Pyramid, representation of a food chain, illustrating the ratio of food producers to varying levels of food consumers.

Food web, numerous food chains that cross one another in a given area; consists of many producers, consumers, and decomposer organisms.

Greenhouse Effect, the heating of any enclosed space by the sun's rays shinning through, or on, its surface, thus raising the temperature above that of the air outside the enclosure. also, the heating of the earth caused by the fact that the relatively short wavelengths of solar radiation penetrate the atmosphere readily and warm the earth by absorption, but the upward radiation by the earth has relatively – long wavelengths that do so readily penetrate the atmosphere.

Ground Water, rain water that has soaked into the ground and collected in underground pools or formed underground streams. It supplies water that comes from wells.

Habit, learned, automatic behavior resulting from many voluntary repetitions of an act.

Habitat, the place where an animal or plant lives.

Herbivore, an organism that eats plants.

Heredity, study of the inheritance of traits.

Host, organism in which a parasite lives

Humus, organic material in soil, produced by plant and animal decomposition.

Inorganic, referring to any substance not originally composed of living matter; also, frequently, referring to any substance that does not contain carbon compounds.

Interdependence, mutual reliance of living organisms on one another for food, support, growth or development.

Interrelationship (Interaction), the interaction between plants and animals and their environment.

Irrigation, the spreading of water over land.

Leach, the dissolving of soluble minerals in soil by water that passes through it.

Lichen, organism composed of two kinds of plants – an alga and a fungus – that are simbiotic.

Life Cycle, the series of stages, or changes in form and function, through which a plant or animal passes during one complete generation.

Limiting factor, that requirement of life (food, cover, etc.) that is in short supply.

Litter, scattered rubbish or trash; any materials which have become useless to us and with which we thoughtlessly clutter our cities and landscape.

Metamorphosis, a series of distinct and rapid changes in the development of an animal as it matures.

Mimicry, the form or color of an animal that gives it the appearance of or a resemblance to some other organism or object in its environment, thus increasing its chances of survival.

Monoculture, cultivation of just one species over a large area.

Mutation, change in an inherited trait caused by a permanent change in a gene.

Mutualism, the existence of two organisms living together to the advantage of each one.

Niche, the environmental resources used by a species in carrying on its way of life is called its niche.

Nitrogen Cycle, the circulation of nitrogen chiefly by means of organisms from the inorganic nitrogen in the atmosphere to nitrate, into proteins and protoplasm in plants and animals, to ammonia, and return to nitrates and nitrites.

Nitrogen Fixation, the process whereby bacteria andn other soil microorganisms convert atmospheric nitrogen into nitrates, which become available to growing plants.

Nutrient, compound in food that can supply energy for cells or materials needed for carrying out their life activities.

Omnivor, an animal that eats both plant and animal food.

Organic, having, or composed of, organs; also, referring to organisms that are alive, or were once alive.

Organism, an individual living plant or animal; also, any living thing.

Osmosis, tendency of two fluids that are separately by something porous to go through it and become mixed.

Oxidation, the combination of a substance with oxygen.

Oxygen, colorless, odorless gas

Parasite, an organism that obtains food, shelter, etc. at the expense of another.

Particulates, dust and soot in the air.

Pesticide, a substance such as a chemical, used to destroy something considered a pest

Photosynthesis, the process by which green plants, using light energy, combine carbon dioxide and water to produce basic food substances.

Plankton, the microscopic floating plants and animal organisms of lakes, rivers and oceans.

Pollination, transfer of pollen to a stigma of a flower from another flower.

Pollution, the act of making or rendering unclean or impure.

Precipitation, moisture that condenses out of the atmosphere and is deposited on the earth in such liquid or solid form as rain hail sleet, snow, dew and frost, etc.

Predator, an animal captures and eats other animals.

Prey, an animal seized by another one to be eaten.

Producer, an organism such as a plant that creates its food from non-living materials and provides food for others.

Protein, a nutrient necessary for growth and repair of organisms.

Protoplasum, all the living substnaces in a cell.

Radioactivity, the slow breaking up of the nucleus of an atom.

Recycle, recovery, purification and reuse of natural resources and man-made products.

Regeneration, renewal of body parts and tissue that have been lost or destroyed through injury or normal wear.

Reproduction, process by which organisms produce offspring.

Reservoir, a place where water is collected and stored

Resource, any supply that will meet a need.

Respiration, part of the process of living involving exchange of gases between living cells and the environment, including accompanying oxidation and release of energy.

Scavenger, an animal that feeds on dead plants or animals.

Sensitivity, ability of a living thing to detect and react to changing conditions.

Smog, a fog made heavier and darker by smoke and chemical fumes.

Soil, a mixture, composed of small rock particles water, air, and organic matter, in which plants can grow.

Solar energy, the radiant energy of the sun.

Sonic boom, shock wave produced by movement of objects through the atmosphere at speeds faster than the speed of sound.

Species, living things of the smae kind.

Succession, process involving the change of communities of plants and animals in an area.

Symbiosis, means "living together" and is now used as an inclusive term to cover commensalism, mutualism, and parasitism.

System, a group of body organs that work together in carrying out a particular life activity.

Thermal pollution, the ejection of heated water into the environment, usually aquatic ecosystems, raising the temperature above normal limits.

Transpiration, loss of water from plants into the surrounding atmosphere.

Vivarium, a small enclosure, usually with glass sides, in which small living plants, animals, or both, are maintained.

Water cycle, circulation of water from bodies of water to the atmosphere, the soil, living things, the atmosphere, and back to bodies of water.

Weather, condition of atmosphere, determined by air pressure, heat, wind and water.

Water table, that level beneath the ground surface below which ground water fills all spaces and saturates all permeable matter.

Wetland, inland, any area that is more or less regularly wet or flooded where, the water table stands at or or above the land surface for at least part of the year.